D23

SOLAR IMAGE INTENSITY RADIOMETER

This instrument is a water-cooled absolute cavity radiometer. The radiometer is silver plated and highly polished to reduce heat absorption to a minimum (to only 5 percent of what it would be were the surface black). The overall absolute accuracy of measurement made by the radiometer is within 1 percent. The individual items that contribute to this accuracy are: (1) area of aperture (0.0158 cm^2) known to about 0.5 percent; (2) electric calibrating power known to about 0.1 percent; and (3) blackness of conical cavity (0.996) known to about 0.2 percent.

Cooling water needed is about one gallon per minute, which flow rate gives a temperature rise of about 15 degrees Celsius. The acceptance angle is 55 degrees, which is characteristic of most concentrators. The time required for a single point measurement is only 4 seconds even for large changes in irradiance from point to point. It was used to measure the maximum intensity of the solar image at the focus of the test bed collector, which reached approximately 14,000 solar constants with all collector mirrors uncovered.